Federal Democratic Republic of Ethiopia

EDICT OF GOVERNMENT

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ET 478 (2000) (English): SEEDS - DETERMINATION OF MOISTURE CONTENT

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ETHIOPIAN
STANDARD

ES 478:2000

(Reaffirmed :2012)

First edition

Seed – Determination of moisture content

ICS: 65.020.20

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Foreword

This Ethiopian Standard has been prepared under the direction of Technical Committee for seeds (TC 16) and published by the Ethiopian Standards Agency (ESA).
The technical contents in the text of this Standard are identical with ES 478:2000 edition while the reissued standard carries some editorial and technical changes observed in the course of systematic review.

Acknowledgement has been made for the use of the indicated publication.
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Seed — Determination of moisture content

1 Scope

This Ethiopian Standard specifies the method for determining the moisture content of seeds.

2 Normative reference

The following standard contain provision which, through reference in this text, constitute provision of this Ethiopian Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this Ethiopian Standard are encouraged to investigate the possibility of applying the most recent editions of the Ethiopian Standard indicated below. Registers of currently valid standards are maintained in the Quality and Standards Authority of Ethiopia.

ES 471:2000, *Seed – Sampling.*

3 Definition

For the purpose of this standard, the definitions in ES 413 and the following shall apply.

3.1
moisture content
is the loss in weight, when a sample dried under specific conditions, It is expressed as percentage of the weight of the original sample.

4 Principle

The methods prescribed are designed to reduce oxidation, decomposition or the loss of other volatile substances while ensuring the removal of as much moisture as possible.

5 Sampling

Samples shall be taken in accordance with ES 471.

6 Apparatus

The following apparatus shall be used:

a) An adjustable grinding mill;

b) Constant temperature oven and accessories which shall include containers and a desecrator;

c) Analytical balance; and

d) Sieves - wire sieves with meshes of 0.50 mm, 1.00 mm and 4.00 mm shall be required.

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7 Procedure

7.1 Precautions

The submitted sample shall be accepted for moisture determination only if it is an intact, moisture-proof container from which as much air as possible has been excluded. The determination shall be started as soon as possible after receipt. During the determination, exposure of the sample to the atmosphere of the laboratory shall be reduced to the absolute minimum. For species that do not require grinding no more than 2 minutes may elapse from the time the sample is removed from the container in which it was received until the working sample is enclosed in the drying container and weighed.

7.2 Weighing

Weighing shall be in grams to three decimal places.

7.3 Working sample

7.3.1 The determination shall be carried out in duplicate on two independently drawn working samples, each of the following weight depending on the diameter of the containers used:

a) Less than 8 cm diameter - 4 to 5;

b) 8 cm diameter or larger – 10.

7.3.2 Before the working sample is drawn, the submitted sample shall be thoroughly mixed by one of the following methods:

a) Stir the sample in its container with a spoon;

b) Place the opening of the original container against the opening of a similar container and pour the seed back and forth between the two containers.

7.3.3 Each working sample shall be drawn in such a manner that the sample is not exposed to the air for more than 30 seconds.

7.4 Grinding

7.4.1 Large seeds shall be ground before drying unless their high oil content makes them difficult to grind or (particularly in seed such as Linum with oil of a high iodine number) liable to gain weight through oxidation.

7.4.2 It shall be obligatory to grind seed of the species indicated in the Table 1.

Table 1 – Species for which grinding is obligatory

Arachis hypogea	Oryza sativa
Avena spp.	Phaseolus spp
Cicer arietinum	Pisum sativum (all vars)
Citrulluslanatus (C.vulgaris)	Quercus spp
Fagopyrum exculentum	Ricinus communis
Fagus spp	Secale cereale
Glycine max	Sorghum spp
Gossypium spp	Triticum spp
Hordeum vulgare	Vicia spp
Lathyrus spp	Zea mays
Lupinus spp	

7.4.3 The grinding shall be done on a submitted sample before drawing the working sample. The required fines of grinding shall be as follows:

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a) For cereal and cottonseeds fine grinding is necessary; at least 50% of the ground material shall pass through a wire sieve with meshes of 0.50 mm and not more than 10% remain on a wire seive with meshes of 1.00 mm ;

b) For leguminous coarse grinding shall be necessary; at least 50% of the ground material shall pass through a sieve with meshes of 4.00 mm.

7.5 Pre-drying

7.5.1 If the species is one for which grinding is necessary and the moisture content is more than 17% (or, 10% in the case of Glycine max and 13% in the case of Oryza sativa), pre-drying is obligatory. Two sub-samples each weighing at least 25 g to the nearest 2.0 mg are placed in weighed containers. The two sub-samples in their containers are then dried to reduce the moisture content to less than 17% (or /10% in the case of Glycine max or 13% in the case of Oryza sativa).

7.5.2 In the case of very moist seed of Zea mays (above 25% moisture content) the seed shall be spread in a layer not deeper than 20 mm and dried at 70°C for 2-5 hours, depending on the initial water content.

7.5.3 In the case of other species with a moisture content exceeding 30%, samples shall be dried overnight in a warm place such as the top of a heated oven. In the cases of other species with moisture content exceeding 30% samples should be dried overnight in a warm place such as the top of a heated oven. In other cases, the samples should be pre-dried in a constant temperature oven at 130°C for 5-10 minutes, depending on the moisture content. The partly dried material is then kept exposed in the laboratory for two hours.

7.5.4 After pre-drying, the sub-samples shall be weighed in their containers to determine loss in weight. Immediately thereafter the two partly dried sub-samples shall be separately ground and the ground material subjected to the procedure prescribed in clause 7.6 or 7.7 herein as appropriate.

7.6 Methods of drying

7.6.1 Low constant temperature oven method

The low-constant temperature oven method shall be used for seed of the species indicated in Table 2.

7.6.2 After cooling, weight the container with its cover and contents. The relative humidity of the ambient air in the laboratory must be less than 70% when the determination is carried out.

The working sample shall be evenly distributed over the surface of the container. The container and its cover shall be weighed before and after filling. The container shall be placed rapidly, on top of its cover, in an oven maintained at a temperature of 103 ± 2°C and dry for 17 ± 1 hours. The drying period shall begin at the time the oven returns to the required temperature. At the end of the prescribed period cover the container and place in a desecrator to cool for 30-45 minutes.

7.7 High constant temperature oven method

Table 2 – Species which require low constant temperature oven method

Allium spp	Raphanus sativus
Arachis hypogaea	Ricinus communis
Brassica spp	Sesamum indicum (S.orientale)
Camelina sativa	Sinapsis spp
Capsicum spp	Solanum melongena and
Glycine max	all tree species except
Gossypium spp	pinus spp.
Linum usitatissimum	

7.7.1 The high constant temperature oven method shall be used for seed of the species indicated on table 3 herein.

7.7.2 The procedure shall be the same as described in

Sub-section 7.6 except that the oven shall be maintained at a temperature of 130-133°C, the sample shall be dried for a period of four hours for Zea mays, two hours for other cereals and one hour for other species and no special requirement pertains to the relative humidity of the ambient air in the laboratory during determination.

Table 3 – Species which require high constant

Temperature oven method

Avena spp.	Medicago spp
Beta vulgaris (all vars)	Nicotiana tabacum
Chloris gayana	phalaris spp
Cicer arietinum	phaseolus spp
Citrullus lanatus	Pisum sativum (all vars)
Cucumis spp	Sorghum spp
Cucurbita spp	Spinacia oleracea
Cuminum cyminum	Triticum spp
Daucus carota	Vicia spp
Hordeum vulgare (all vars)	Zea mays
Lactuca sativa	
Lycopersicon esculentum	

8 Expression of results

8.1 Constant temperature oven method

The moisture content as a percentage by weight shall be calculated to one decimal place by means of the following formula:

$$M_2 - M_3 \times \frac{100}{M_2 - M_1}$$

Where,

M_1 is the weight in grams of the container and its cover,

M_2 is the weight in grams of the container, its cover and its contents before drying, and

M_3 is the weight in grams of the container, cover and contents after drying.

If the material is pre dried, the moisture content shall be calculated from the results obtained in the first (pre-drying) and second stages of the procedure. If S_1, is the moisture last in the first stage, and S_2 is the moisture lost in the second stage, each calculated as above and expressed as a percentage, then the original moisture content of the

$$S_1 + S_2 - \frac{S_1 \times S_2}{100}$$

sample calculated as percentage is:

8.2 Tolerance

Take as the result the arithmetic mean of the duplicate determinations carried out on a sample if the difference between the two determination does not exceed 0.2%. Otherwise, repeat the determination in duplicate. For tree and shrub species where it has been found impossible to meet this tolerance ranging from 0.3 to 2.5% are prescribed related to seed size and initial moisture content as shown Table 4.

Table 4 – Tolerance levels for differences between two determinations of moisture content of tree and shrub seeds

Class	Seed Size Sumber of Pure seeds/kg	Initial Moisture Content	Tolerance %
Small seeds	>5000	<12	0.3
Small seeds	>5000	>12	0.5
Large seeds	<5000	<12	0.4
Large seeds	<5000	12-25	0.8
Large seeds	<5000	>25	2.5

9 Test result

The test result for moisture content shall be reported to the nearest 0.1%.

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Ethiopian Standards Agency

Organization and Objectives

The Ethiopian Standards Agency (ESA) is the national standards body of Ethiopia established in 2010 based on regulation No. 193/2010.ESA is established due to the restructuring of Quality and Standards Authority of Ethiopia (QSAE) which was established in 1970.

ESA's objectives are:-

- Develop Ethiopian standards and establish a system that enable to check weather goods and services are in compliance with the required standards,
- Facilitate the country's technology transfer through the use of standards,
- Develop national standards for local products and services so as to make them competitive in the international market.

Ethiopian Standards

The Ethiopian Standards are developed by national technical committees which are composed of different stakeholders consisting of educational Institutions, research institutes, government organizations, certification, inspection, and testing organizations, regulatory bodies, consumer association etc. The requirements and/ or recommendations contained in Ethiopian Standards are consensus based that reflects the interest of the TC representatives and also of comments received from the public and other sources. Ethiopian Standards are approved by the National Standardization Council and are kept under continuous review after publication and updated regularly to take account of latest scientific and technological changes.
Orders for all Ethiopian Standards, International Standard and ASTM standards, including electronic versions, should be addressed to the Documentation and Publication Team at the Head office and Branch (Liaisons) offices. A catalogue of Ethiopian Standards is also available freely and can be accessed in from our website.

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More Information?
Contact us at the following address.
The Head Office of ESA is at Addis Ababa.

☎ 011- 646 06 85, 011- 646 05 65
📠 011-646 08 80
✉ 2310 Addis Ababa, Ethiopia
E-mail: info@ethiostandards.org,
Website: www.ethiostandards.org

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